Degree Of Hazard Evaluation Program

USER'S GUIDE

Version 1.1

Illinois Hazardous Waste Research and Information Center

Illinois Department of Energy and Natural Resources

Originally programmed by the Institute for Environmental Studies, University of Illinois for the Illinois Hazardous Waste Research and Information Center.

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Users Guide
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Introduction

In 1984 the Illinois legislature mandated a study of the benefits and feasibility of establishing a system of classifying and regulating special waste according to its degree of hazard. The term "special waste" includes all federally regulated hazardous wastes, as well as industrial process wastes and pollution control wastes as defined by the state of Illinois (non-RCRA industrial wastes).

This Degree of Hazard system was developed as a scientifically sound and consistent way to deregulate non-RCRA special wastes that pose low or negligible hazard. It is one of several criteria used by IEPA when considering an application to deregulate a special waste. In Illinois, non-RCRA special waste must be disposed of in a landfill or other facility permitted to receive special waste. The cost of disposing of special waste is higher than if it can be deregulated and disposed of as a municipal waste. It was also expected that more stringent regulations might be needed for non-RCRA special wastes that pose a higher degree of hazard. The current degree of hazard system was adopted into regulations by the Illinois Pollution Control Board in 1990. A copy of the regulations is provided in Appendix A.

The degree of hazard system is based on evaluation of five characteristics of a waste stream: weighted-accumulative toxicity of constituents (as modified by environmental fate), disease potential (infectious waste), fire (ignitability), leaching agents (pH), and biological hazard (biodegradability).

The primary determinant of the degree of hazard is toxicity. To conduct a degree of hazard analysis requires knowledge of the volume and the percentage composition of the primary chemical constituents in the waste stream. It is the chemical form and concentration of each constituent that significantly affects the toxicity score for the purposes of this system. Having this information allows one to determine, for example, which chemical constituents have the highest relative toxicity. A strategy can then be developed, such as waste segregation or process change, for reducing those chemicals in the waste and the degree of hazard for the entire waste stream can then be reevaluated.

In addition to allowing a company to determine the effectiveness of pollution prevention measures on their waste stream degree of hazard, the IEPA has said using the Degree of Hazard evaulation program would be a significant contribution to an application for "recyclable" status. The current degree of hazard system was adopted into regulations by the Illinois Pollution Control Board in 1990.

Degree of Hazard Program

The Degree of Hazard program is a computer model which incorporates the Degree of Hazard Methodology as developed by the Institute for Environmental Studies at the University of Illinois through funding by the Hazardous Waste Research and Information Center. The Degree of Hazard Methodology is an evalua-

tion process which identifies the toxicity, fire, disease, leaching, and environmental hazards within a specific waste stream. The details of the various calculations are described within the *Illinois Administrative Code, Section 808, Appendix B* (copy attached). The Degree of Hazard (DOH) program allows entry of the components of a specific waste stream, computes the degree of hazard for the waste stream, and displays or prints the results. Several related reports may be generated and printed.

System Requirements

The Degree of Hazard program was written in Clipper (Summer '87 version), a dBase language compiler. It requires an IBM PC or compatible computer with a hard disk, 512K of memory, and a color monitor. The printer should be compatible with either the Epson or Hewlett Packard LaserJet standards. The current version only supports printers which are setup and connected to LPT1.

Installation

Installation of the DOH program is a simple process. The first step is to create a dedicated subdirectory on the hard disk of the computer. The second step is to copy the contents of the distribution diskette to the hard disk. The last step involves de-compressing the archived program files. All of the steps are specified below:

1. place the distribution diskette in drive A:
2. go to DOS
3. type CD\ (move to the hard disk root directory)
4. type MD DOH (make a new subdirectory)
5. type CD DOH (change to the new subdirectory)
6. type COPY A:*.* (copy the files from the diskette)
7. type DOH-ZIP (start program de-compression)

Press **Return** at the end of each of the above commands. The DOH program is ready to run. Type "**DOH**" and press **Return** to start the program.

Program Conventions

Within the DOH program, the **Return** key is used to confirm an entry of data, either numeric or character. Even when only a single character is entered, the **Return** key must be used to conclude the entry. The **Escape** key is used to retreat or move backwards to the previous menu or function. The **Arrow** keys may be used to move in a forward or backward direction through the fields of a data entry screen.

Picklists are used throughout the DOH program. A picklist is a scrollable list of information that is bounded by a box or window on the screen. A picklist may be thought of as a 'menu of data' from which to choose. A **highlight bar** is used instead of a cursor to indicate the current position. The highlight bar is moved with the arrow keys and paging keys. Once the highlight bar is on the desired row of data the **Return** key will select that row and act upon it, usually by displaying all the related data on a new screen. As elsewhere, the **Escape** key will move back to the previous screen or menu. Within a picklist the **Page Up** and **Page Down** keys will scroll the list of items either forwards or backwards by one screen.

The **function keys** (F1 through F10) are used at various points within the DOH program. Their functions and those of any other special-purpose keys are displayed at the bottom of the screen in a **prompt line** which labels the active keys.

The functions of the Degree of Hazard program can be divided into four primary sections: permit applications, substance inventory, reports, and database maintenance. The Main Menu displays these four program options plus the 'Quit' option to exit the program. Figure 1 shows the DOH Main Menu screen. Main Menu option #1, Applications, is the only option which allows new information to be entered into the database.

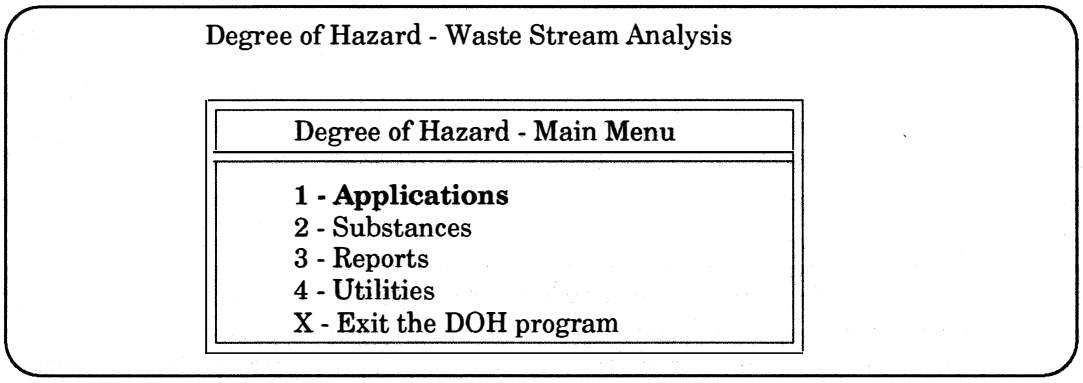

Figure 1. DOH Main Menu Screen

Option #1 Applications

Option #1 allows new permits to be entered or existing permits to be edited. Each of these two major functions will be discussed separately. Both of the major functions have two phases, one for the top half of the screen and a second for the bottom half of the screen. The two phases occur in sequence.

[Non-RCRA Special Waste Application]

Authorization Number: **9999** Date Entered: **4/23/1992**

SIC Code: **4530**
Data Source:
Process Name: **Environmental Test of Degree of Hazard**

Quantity: **6400** kg/month Phase (solid, liquid, gas): **liquid**
Flashpoint: **445.0**°F pH Value: **7.0** Disease Haz. (y/n): **N**

Calculated Data

Environmental Fate: **295.54768000** Toxic Amount: **109**
Equivalent Toxic Concentration: **0.01702286** Toxic Score: **2**

[Waste Stream Components]

Component Name	CAS#	Concent. (%)	Toxic Data
KEROSENE	8008-20-6	0.03420000	Oral
LINDANE	58-89-9	0.00030000	Oral
MAGNESIUM SILICA FLOURI	18943-30-1	1.09000000	NO DATA
NYLON	63428-83-1	97.40000000	NO DATA
LEAD	7439-92-1	0.00230000	NO DATA
111 TRICHLOROETHANE	71-55-6	1.00000000	Oral

F3: Edit **F4: Print** **F7: Delete** **ESCape: Exit**

Figure 2. Permit Screen

While in the **first phase** the prompt line shows only a single option: ESCape. If ESCape is pressed the cursor leaves the top half and moves to the bottom half of the screen (phase two). If the ESCape key is not used, then phase one is naturally ended when the last field (Disease Haz.) is filled in.

During the **second phase** the prompt line at the bottom of the screen has several options. It is possible to add or delete components from the waste stream as well as modify the amount (concentration) for existing components. The arrow and page keys are also active. They will move the highlight bar within the list of components. Pressing Return will popup a small edit window for the currently highlighted component. Here the amount may be modified as desired.

There is also a section of calculated fields on the 'Permit' screen which are filled in by the program. They are: Date Entered, Environmental Fate, Equivalent Toxic Concentration, Toxic Amount, and Toxic Score. Each of these fields is calculated during the DOH calculation.

When selected, option #1 displays a picklist of permit applications that includes their process name and authorization number. The list is sorted by authorization number. A **new permit application** is created by pressing F2 at the picklist of permits. The permit application number is the first field to be entered and it must be 'unique'. That is, it cannot duplicate an existing permit number in your database. Up to XX numbers may be chosen for this field. After all the phase one fields in the top half of the screen have been completed the **substance picklist** will appear for selecting the waste stream components. Figure 3 shows this picklist (with a different title at the top). Simply move the highlight bar as needed to choose the first component. Press Return and a small box pops up to request the 'waste stream concentration'. This is the percentage, **by weight**, for this component within the entire waste stream. The second question asks if this percentage value represents the limits of detection. The default is no, so be sure to press Y if the component was NOT detected in the waste stream. Continue selecting substances that make up the components of the waste stream until all have been selected and entered. When finished press the ESCape key and the picklist will disappear to reveal the completed 'Permit' screen.

The new permit has now been added to the database. The last step is the DOH calculation. Simply press ESCape and the DOH calculation is triggered. The DOH calculation steps through all the components, calculating and summing their toxic concentrations and environmental fate scores. This takes place in a small window near the center of the screen. The process is fairly rapid and should only require a second or two. When finished with the DOH calculation, the program displays the results in the current window and then returns to the picklist of permits.

The **prompt line** at the bottom allows four options. The last three are simple and straightforward. Both **Print** and **Delete** will display a small popup window that asks for confirmation of the selected function. In both cases the default choice is NOT to continue with the current operation. If **Print** is chosen, the current permit application will be sent to the printer. If **Delete** is chosen the permit application is then deleted and the program returns to the picklist of permits. **ESCape** does none of the above but returns directly to the picklist of permits.

To work with an **existing permit application** simply highlight the desired row of data within the picklist and press Return. The permit screen will appear on the monitor as shown in Figure 2 but with different data. The **prompt line** at the bottom of the picklist window shows the current options. The Return key will display the currently highlighted permit and, once selected, it may be edited, printed, or deleted.

The first option in the prompt line is **Edit**. By pressing F3 the edit mode becomes active. If any data in the last five fields of phase one is modified, it will trigger a DOH calculation when the 'Permit' screen is exited. This DOH calculation is identical to the one that takes place when a new permit application is created.

The F7 key will allow a component to be deleted. Confirmation is required to complete the deletion. The F2 key is for adding a new component to the existing waste stream. This process is the same as for new permits. It should be noted that the program currently has no check for 'total percentage concentration'. So it is possible to enter (or edit) numbers for a waste stream such that they do not sum to 100%. Ideally the sum is 100%, but it is up to the user to determine what the actual total concentration of the waste stream components will be.

Option #2 Substances

This option displays a picklist of substances listed in alphabetic order. The arrow and page keys may be used to scroll and move through the list. Also, any alpha key may be used to quickly go to the first substance in the list that begins with that letter of the alphabet. For instance, by pressing the letter "A" the list will quickly scroll to display all the "A"s, beginning with "ABS POLYMERS", which is the first substance within the "A"s (Figure 3). Using the arrow keys, move the highlight bar over the desired substance.

Choose a Substance to View

Name	CAS Number
ABS POLYMERS	9003-56-9
ACETIC ACID	64-19-7
ACETIC ACID, BARIUM SALT	543-80-6
ACETIC ACID, MERCURY (1+) SALT	631-60-7
ACETIC ACID, SILVER (1+) SALT	563-63-3
ACETIC ACID, VINYL ESTER	108-05-4
ACETONE	67-64-1
ACETONITRILE	75-05-8
ACRYLIC RESIN	9003-01-4
ALACHLOR	15972-60-8
ALUM SILICATE	1302-76-7
ALUMINUM	7429-90-5
ALUMINUM HYDROXIDE	21645-51-2
ALUMINUM OXIDE	1344-28-1
ALUMINUM SILICATES	1214-46-7
ALUMINUM SULFATE	10043-01-3
AMMONIA	7664-41-7

↑ , ↓ PgUp PgDn ↵ (Select)

Figure 3. Choose a Substance to View Screen

After highlighting the desired substance, simply press the return key and the substance data screen will appear (see Figure 4). This screen shows all the available physical and toxicological data. In some cases there is no toxicological data, which

indicates that a literature search was performed for the substance, but nothing was found.

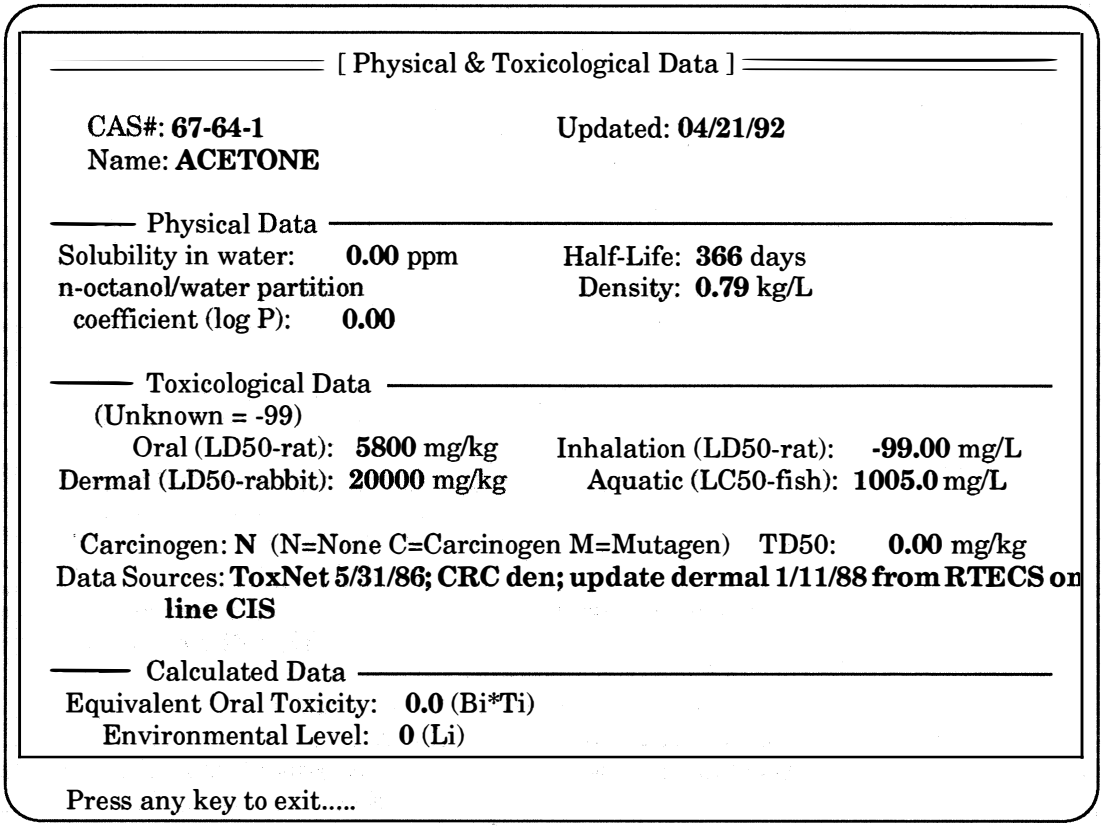

Figure 4. Substance Data Screen

The list of substances in the substance table represents the most common hazardous waste stream components. The substance table contains 272 entries, but is far from 'complete' at this time. If a waste stream component is not found in the substance table it is simply due to the limited resources devoted to the task of expanding the list. If an important component is not found in the substance table it can generally be assumed that the substance is either innocuous or has no toxicological data. On the other hand, if a literature search for toxicological data on the substance is productive, then we will include the substance in the next release of the Degree of Hazard Evaluation Program. Please submit any new data to the address shown on the bottom of page 14.

Option #3 Reports

Option #3 allows the printing of four different reports. The Report Menu is shown in Figure 5. The first three reports use the same tabular format. The first report includes all the substances and sorts them in alphabetic order (by name). The second report contains the same data, except the list is sorted by the equivalent oral toxicity (BiTi) for each substance. The third report includes only those substances for which there is no toxicological data. This is simply a way of showing that an unsuccessful literature search was done for these substances.

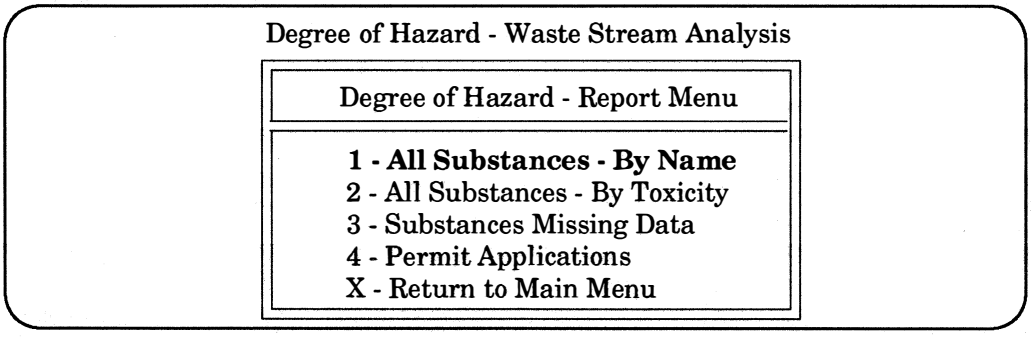

Figure 5. The Report Menu

The last report menu option is Permit Applications. When this option is selected the picklist of permits is displayed in a scrollable window. Simply highlight the process name of the permit to be printed and press Return. The report will be sent to LTP1.

Option #4 Utilities

Option #4 is the Utilities Menu. It offers five tasks, the most important being option #2, Backup Data. The first option is Pack Data. This copies and re-indexes the primary data files. It should not be needed often, but is useful if any permit applications have been deleted, because it re-claims the disk space used by deleted data.

The second Utilities Menu option is **Backup Data to Diskette**. This option should be performed after every 2-3 hours of use to insure against loss of data. The need to do backups cannot be over-emphasized. If a power problem occurs during data entry or a hardware failure takes place, datafiles could be lost. All the thought and effort which went into creating specific permit applications would have to be repeated (if a recent backup doesn't exist). Perform regular backups! After selecting the backup option, follow the message prompts as displayed on the screen. Completely label the backup diskette by including the date and time.

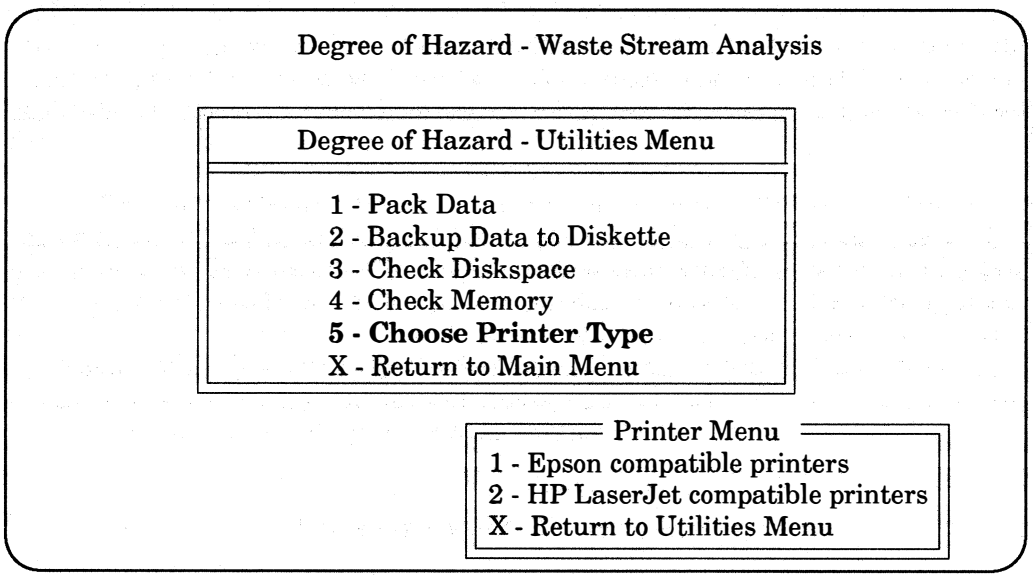

Figure 6. Utilities Menu

Options 3 and 4 are simple checks of the 'environment' and are primarily for convenience. They display the free space on the harddisk and in memory respectively. If the program is not functioning properly use these options to verify that sufficient diskspace and memory are available. The free diskspace should be at least 8000 bytes and the free memory should be at least 50K.

The last option on the Utilities Menu is 'Choose Printer Type'. This selection brings up a small submenu with just three choices (as shown in Figure 6). Simply highlight the proper printer type and press Return. Most dot matrix printers are Epson compatible or can be setup to be. Most laser printers are compatible with the Hewlett Packard LaserJet series of printers. The reports which print the substance data are the only ones affected by this choice. If neither of these choices work properly for your printer please inform us by filling out the evaluation form in the appendix.

Working With the Numbers

In this section we will discuss the Degree of Hazard calculation process and the relationships between some of the important numbers. By understanding the process we can better develop strategies for reducing the Toxic Score and possibly declassifying a waste stream.

The Degree of Hazard program is basically just an expedient way to perform a pre-defined calculation. All of its calculations can be done by hand or with a calculator by following the definitions and formulas in Section 808, Appendix B of the Illinois Administrative Code (reprinted in Appendix A of this manual). The program simply automates and speeds up those calculations. By far the more difficult process is to accurately determine the concentration of the various components within a particular waste stream!

The following table shows the direct relationship between the calculated Toxic Amount and the derived (unadjusted) Toxic Score. It disregards the influence of the Environmental Fate Score which is shown in Table 2.

Toxic Amount	(unadjusted) Toxic Score	Waste Classification
< 100	0	Declassifiable
100 - 999	1	Class B
1000 - 9999	2	Class B
> 9999	3	Class A

Table 1.

The Toxic Amount is the product of the waste stream size times the equivalent toxic concentration for the waste stream. Obviously, if a particular Toxic Amount is only slightly larger than a lower cutoff point, it would be very desirable to reduce either the size or the equivalent toxic concentration of the waste stream. For example, if the Degree of Hazard calculation produces a Toxic Amount of 116 the Toxic Score is 1 and the waste stream is Class B. In this case it would only require a 15% drop in the size of the waste stream to reduce the Toxic Score to 0 and become declassified. Alternatively, a 7% drop in the waste stream size coupled with an 8% decrease in the equivalent toxic concentration would produce the same result. Any cumulative decrease in both the size and toxic concentration that totals 15% would be effective in lowering the Toxic Score.

Environmental Fate Score	Unadjusted Toxic Score			
	0	1	2	3
	Adjusted Toxic Score			
> 199	0	2	3	3
100 - 199	0	1	2	3
< 100	0	0	1	3

Table 2.

Table 2 illustrates the relationship between the unadjusted Toxic Score and the Environmental Fate Score. The unadjusted Toxic Score remains unmodified when the Environmental Fate Score falls between 100 and 199. It is modified only when its value is either 1 or 2 and the Environmental Score is outside the 100-199 range. An unadjusted Toxic Score of 1 or 2 is decreased by 1 when the Environmental Score is less than 100. Conversely, it is increased by 1 when the Environmental Score is greater than 199.

Table 3, below, combines the information found in both Table 1 and 2. Reading the columns from left to right illustrates the path taken by the Degree of Hazard calculation. First, the Toxic Amount is calculated. Second, an unadjusted Toxic Score is derived. Third, the Environmental Score is produced and potentially modifies the Toxic Score. The adjusted Toxic Score is then used to determine the waste stream classification.

Toxic Amount	(unadjusted) Toxic Score	Environ. Fate Score	Toxic Score	Waste Class.
< 100	0	Doesn't Matter	0	Declass.
100 - 999	1	< 100	0	Declass.
100 - 999	1	100 - 199	1	Class B
100 - 999	1	> 199	2	Class B
1000 - 9999	2	< 100	1	Class B
1000 - 9999	2	100 - 199	2	Class B
1000 - 9999	2	> 199	3	Class A
> 9999	3	Doesn't Matter	3	Class A

Table 3.

There are several instances of substances which exist in the substance table, but do not include enough data to be assigned an equivalent oral toxicity level. These substances will not be a factor in the calculation of the total Equivalent Toxic Concentration, but will still be included in the Environmental Fate Score. If such a substance is a waste stream component, its toxic effect will be unknown and would need to be subjectively judged.

The Environmental Fate Score is independent of the total size of the waste stream. However, it is dependent upon the concentration of the components within the waste stream. For this reason, there may occur situations where an increase in the size (through dilution techniques) of a waste stream could reduce it's Adjusted Toxic Score. For example, acrylic resin exists in the substance table and has no toxicity data, but has a high Li (environmental level) value. If it were present in a relatively high concentration, it would have no effect on the total Equivalent Toxic Concentration, but it's Li could be enough to push the Environmental Fate Score from less than 100 to more than 200. As shown in Table 2 this would be the difference between Toxic Scores of 0 or 2! By eliminating or greatly reducing the concentration of acrylic resin (through either source reduction or dilution) the waste stream could be a better candidate for declassification.

As seen in the previous example, any analysis of ways to lower the adjusted Toxic Score must take into account the specific data that is available in the substance table for each component of the waste stream. The two key fields in the substance table are the Environmental Level (Li) and the Equivalent Oral Toxicity (BiTi). They are the 'calculated' fields which appear at the bottom of the 'view substance' screen. They are calculated or derived from other data shown on the screen according to the rules spelled out in the Illinois Administrative Code. (See Appendix A of this manual for a reprint of Section 808.) These calculated values are determined before they are submitted to the Degree of Hazard substance table and remain constant throughout the Degree of Hazard program and the DOH calculation.

The printout of the permit application provides further insight into the characteristics of the waste stream. The "<" symbol to the left of the concentration data indicates that the component concentration was below the detection limit. The words "NO DATA" in the "Eqv. Tox." column indicate that there is no toxicological data for this substance. The word "INNOCUOUS" means that the toxicological data indicates that the substance has no significant toxic effects.

The application permit report prints the waste stream components ranked in descending order of toxicity. The Environmental Fate Score is also shown. The Environmental Fate Score and the Toxic Amount can be considered independent of each other. Statistically speaking, one of them could be decreased with no effect on the other. For example, dilution techniques can be effective in lowering the Environmental Fate Score, but have no effect on the Toxic Amount (as concentration decreases, size increases in direct proportion). But practically speaking, any techniques that strive to decrease one of them will probably have a beneficial effect on the other. The greatest possible benefit would be achieved by developing reduction and treatment techniques that target those components which have the highest combined score (Env. Fate + Eqv. Tox).

Glossary

Term	Definition
Adjusted Toxic Score	The Toxic Score after adjustment by the Environmental Fate Score.
Bi	Conversion factor used to normalize toxicity values to their oral equivalent.
BiTi	The Equivalent Oral Toxicity for a single component - toxicity times the conversion factor.
Ceq	The sum of each component's Equivalent Toxic Concentration for the entire waste stream.
Ci	Concentration of a waste stream component by weight.
Environmental Fate Score	The sum of each component's LiCi for the entire waste stream.
Equivalent Toxic Concentration	The component concentration (Ci) divided by the Equivalent Oral Toxicity (BiTi)
Li	The Environmental Level for each substance as determined by the table in Section 808, Appendix B, Subsection j.
LPT1	The default printer port on a PC. Up to three printer ports are possible: LPT1, LPT2, and LPT3.
Reference Material	Copper Sulfate - 100 Kg/month of 100% copper sulfate has a toxic amount of 10,000, which defines the borderline between a toxic score of 2 or 3.
Ti	Toxicity of a substance as measured by either oral rat, inhalation rat, dermal rabbit, or aquatic toxicity.
Toxic Amount	The product of multiplying the waste stream's Ceq and size (in Kg/ month).
Toxic Score	Based only on the Toxic Amount, it is one of four categories: either 0, 1, 2, or 3.

Appendices

A: Illinois Administrative Code

This Appendix describes the method by which a generator of special waste or the waste source shall determine the toxic score for a waste.

a) The wastestream equivalent toxic concentration (Ceq) is calculated as follows:

Ceq=A * SUM(Ci/Bi*Ti)

where:

1) SUM means the sum of the results of the calculation in parentheses for each component of the wastestream;

2) Ci is the concentration of component i as a percent of the waste by weight;

3) Ti is a measure of the toxicity of component i, as provided in subsection (h);

4) A is a constant equal to 300, and

BOARD NOTE: A is a constant used to allow the entry of percent values for Ci, and to adjust the results so that a reference material, 100 percent copper sulfate, with an oral toxicity of 300 mg/kg, achieves an equivalent toxic concentration of 100.

5) Bi is a conversion factor used to convert the toxicity of component i (Ti) to an equivalent oral toxicity. Bi is determined from subsection (i).

b) The toxic amount (M) is calculated as follows:

M=S * Ceq

where:

1) S is the maximum size of a wastestream shipment in kg/month (Such maximum size shall be specified as a condition of the wastestream classification.); and

2) Ceq is the equivalent concentration from subsection (a).

c) The toxic score is calculated as follows:

1) If the toxic amount (M) is less than 100, the toxic score is 0.

2) If the toxic amount is greater than or equal to 100 and less than 1000, the toxic score is 1.

3) If the toxic amount is greater than or equal to 1000 and less than 10,000, the toxic score is 2.

4) If the toxic amount is greater than or equal to 10,000, the toxic score is 3.

BOARD NOTE: 100 kg/month of the reference material, 100 percent copper sulfate, has a "toxic amount" of 10,000, defining the borderline between a "toxic score" of 2 or 3 for a small quantity generator.

d) The toxic score shall be used as follows:

1) If the toxic score is 0 or 3, the toxic score shall be used forthe purposes of Section 808.245 without adjustment.

2) If the toxic score is 1 or 2, the toxic score shall be adjusted based on environmental fate, pursuant to subsections (e), (f) and (g).

e) The environmental fate score (F) is calculated as follows:

F=SUM(Ci * Li)

where:

1) SUM means the sum of the results of the calculation in parentheses for each component of the wastestream;

2) Ci is the concentration of component i as a percent of the waste by weight; and

3) Li is the environmental level of component i, as determined by subsection (j).

f) The toxic score is adjusted as follows:

1) If the environmental fate score (F) is less than 100, subtract 1 from the toxic score;

2) If the environmental fate score is greater than or equal to 100 and less than 200, the toxic score is not modified;

3) If the environmental fate score is greater than or equal to 200, add 1 to the toxic score.

g) Use the toxic score or adjusted toxic score calculated pursuant to subsections (b) through (f) for the purposes of Section 808.245.

h) Sources of toxicity data.

1) The generator is required to provide informa tion to substantiate that any waste is other than a type A waste.

2) Carcinogens and mutagens. If available, use a TD50 oral rat to represent toxicity based on carcinogenicity and mutagenicity. Otherwise:

A) Carcinogens are assigned a Ti of 0.1 mg/kg; and

B) Mutagens are assigned a Ti of 0.6 mg/kg;

3) Toxicity values shall be selected according to the following criteria:

A) Toxicities are converted to equiva lent oral toxicities as specified in subsection (i);

B) Toxicity values are ranked by source according to the following priorities, with the sources listed in descending order of priority:

i) First oral rat, then inhalation rat, then dermal rabbit, then aquatic toxicity; or

ii) If data from these bases is unavailable, then other mammalian toxicity values;

C) If there is more than one toxicity value for the toxicity from the highest priority available source, the lowest (most toxic) equivalent oral toxicity value is used.

i) Conversion factors for equivalent oral toxicities. The following conversion factors must be used to convert toxicity values to equivalent oral toxicities (Bi) (If a carcinogen or mutagen is assigned a value for Ti in the absence of a TD50, Bi is assigned a value of 1.):

Toxicity measureUnitsBi

Oral-LD50mg/kg1.

Carcinogen/mutagen—TD50mg/kg1.

Aquatic-48 or 96/hr LC50ppm5.

Inhalation - LC50mg/125.

Dermal - LD50mg/kg 0.25

j) Environmental levels. If the waste constituent is innocuous, the environmental level (Li) is equal to 0. Otherwise, Li for a component is the highest level for that constituent in the following table, based on bioaccumulation, persistence and solubility (If a value is on the boundary between ranges, the higher value of Li is used.):

Bioaccumulation		Persistence		Solubility		Li
Min	Max	Min	Max	Min	Max	
5	—	365	—	10,000	—	3
4	5	30	365	1,000	10,000	2
0	4	0	30	0	1,000	1

1) "Innocuous" waste constituents are those for which BiTi, as determined pursuant to subsection (a), is greaterthan 5000 mg/kg.

2) Bioaccumulation is measured as the logarithm to the base 10 of the n-octanol/water partition coefficient for the waste constituent, as measured pursuant to ASTM E 1147, incorporated by reference in Section 808.111.

3) Persistence is determined pursuant to subsection (k).

4) Solubility is measured as parts per million on a weight basis. Solubility may be measured pursuant to ASTM E 1148, incorporated by reference in Section 808.111.

k) Persistence. If available, a value for persistence, measured pursuant to subsection (k)(1), must be used.

Otherwise, the table of subsection (k)(2) must be used.

1) Persistence must be measured pursuant to ASTM E 896, incorporated by reference in Section 808.111.

2) Persistence may be estimated using the following table (The longest half-life indicated must be used for constituents which fit into more than one category.):

Type of Compound or Material	Half Life (days)
Metal, metal oxide or inorganic oxide	366
Inorganic salts	366
Asbestos	366
Clay	366
Plastics or polymers	366
Pesticides	366
Halogenated hydrocarbons	366
Polyaromatic hydrocarbons and biphenyls	366
Phthalate esters	366
Paper products	366
Fats, oils and greases	366
Resins and pigments	366
Aromatic and alicyclic hydrocarbons	31
Aliphatic hydrocarbons	
More than 10 carbons	31
10 carbons or less	1
Waste constituents not otherwise listed	366

B: Program Updates

The Degree of Hazard program is currently undergoing revision and improvement. With input and suggestions from users, we will be better able to provide a quality program. Please take a moment to fill out the following evaluation form.

Degree of Hazard Program Evaluation Form

Company (optional): _____

Agency/Industry (SIC code): _____

DOH Usage/Purpose: _____

_____

Total Hours of DOH Use: _____

Problems with User Guide: _____

_____

_____

_____

Functional Problems with the Program: _____

_____

_____

_____

Conceptual Problems with the Program: _____

_____

_____

_____

Suggestions for Future Releases: _____

_____

_____

_____

Copy and Return to:

Hazardous Waste Research and Information Center
One East Hazelwood Dr.
Champaign, Illinois 61820

Degree of Hazard

User Manual Modifications for Version 2.1c

Text

Page 2. -Installation. ***Start the Degree of Hazard by typing "D" and pressing RETURN.***

Page 2. -System Requirements. The Degree of Hazard program now requires 640K of memory, not 512K.

Page 4. -Option #1 Applications. The paragraph at the top of page 4 describes the use of the Escape key during editing of the application data. The Escape key no longer functions during the first phase of editing.

Page 5. -Option #1 Applications. Read the information about Graphs and Charts as described in the New Features section.

Page 5. -Option #1 Applications. At the end of this section add the following sentence: Any total percentage concentration that is less than 100% assumes that the missing components are innocuous.

Page 5. -Option #2 Substances. Read the new information about Substance Selection Options in the New Features section.

Page 6. -Option #3 Reports. Read the information about the Report Destination Selection in the New Features section.

Page 7. -Option #4 Utilities. The Utilities Menu has been expanded. Read the information about Printer Port Selection found in the New Features section.

Figures

Figure 1. - no change

Figure 2. -The data fields in the top half of screen have been moved up one line to allow for a new field in the Calculated Data section. It's labeled: "Quantity to reach next (lower) Toxic Score". At the very bottom of the screen are new function key labels for: F1: Help and F8: Graphs. The F1 key invokes a help screen which offers additional instructions or background information. The F1 (Help) key is active in several locations throughout the program. The F8 key invokes a submenu of pie charts and bar graphs which may be displayed for the current waste stream.

Figure 3. -At the bottom of the window are new function key labels for: F1: Help and F5: Toggle Display. F5 will switch between a substance list sorted by CAS number and a substance list sorted alphabetically by name.

Figures 4 and 5. -no change

Figure 6. -The Utilities Menu now has 7 options listed in a slightly different order. The new option is "Choose Printer Port", which allows selection of LPT1, 2, or 3 as the default printer port.

Degree of Hazard

New Features of Version 2.1c

Expanded Substance List: The substance list is larger than ever and now contains 568 items, 469 of which have a BiTi value (toxicity or carcinogenic/mutagenic value). All of the EPA Section 313 chemicals are included. Forty-six of the 50 substances on the Illinois EPA Special Waste Stream Permit Application are included. The list of synonyms has been expanded to include more of the common names and acronyms.

User Help System: The F1 key calls up a context-sensitive help screen which contains instructions or background information. Help screens are available at several points within the program. Each one is specific to the function that is currently being performed.

Graphs and Charts: The values of the waste stream component list can be displayed and printed in a bar graph or pie chart. Either the relative toxicity or the environmental risk level can be used as the X-axis value. The submenu for graphs is available from the permit application screen with the F8 key.

Printer Port Selection: The default printer port can now be selected. This allows reports and printouts to be routed to any of 3 possible printer ports. This is particularly useful on a local area network where there may be several network printers available.

Data Entry Picklists: Simple picklists of choices have been added. When a field has only a limited number of possible values a picklist makes it easy to select and enter a valid choice. An example is the 'Phase' field which can be either 'gas', 'solid', or 'liquid', but nothing else.

Choice of Units of Measure: The waste stream quantity now offers 6 choices for the units of measure: Kg/month, Kg/year, Lbs/month, Lbs/year, Tons/month, or Tons/year. After a unit of measure is selected the numeric value is entered. Then the program converts that value to a Kg/month value for internal consistency and ease of comparison.

Report Destination Selection: Any of the available reports may now be routed to: the screen, a file, or the printer. The screen destination is useful for a preview of a report that might later be printed. The file destination allows a report to be imported into a word processor or other application software.

Substance Selection Options: The substance list may be accessed by CAS number or name. The F5 key toggles the order in which the substance list is displayed. When in CAS number order, pressing the first digit of the CAS number will go to the portion of the list starting with that number. Likewise, when in alphabetic order by name the first letter of the name may be used to quickly go to that section of the list. When the list is in CAS number order it is easy to see all of the available synonyms for a single substance.